CRADA facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

GAS STREAM cleanup
PROJECT

COLD-FLOW CIRCULATING FLUID-BED UNIT

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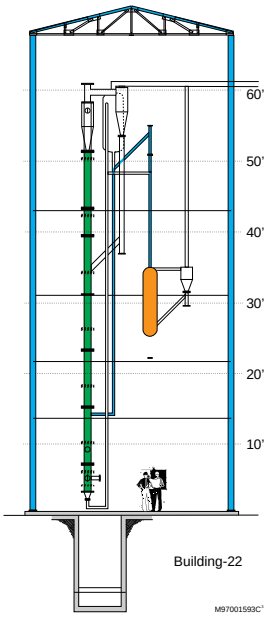
Capabilities

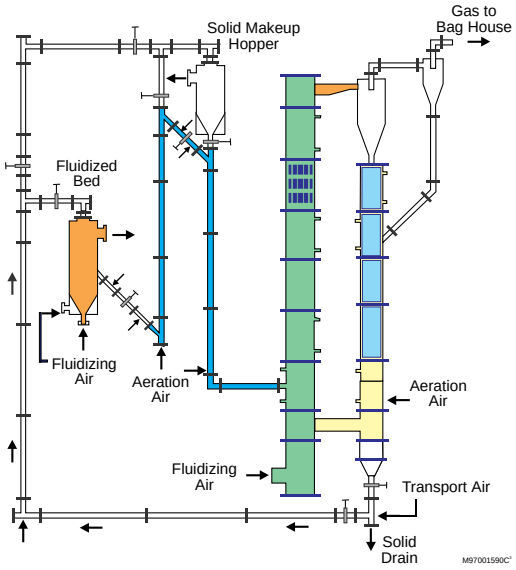
A cold model is being designed and constructed at FETC as a flexible, generic facility. Shakedown and optimization of novel coal fluidized-bed reactors require that we solve the various technical issues of gas-solid transfer. These issues are encountered in both integrated gasification combined-cycle (IGCC) and advanced pressurized fluidized-bed combustion (APFBC) power trains. Tools are needed to visualize solids flow systems. The objective is to provide support to circulating fluid-bed (CFB) systems through analysis of existing plants, optimization of plant operations, and evaluation of new designs.



Elevation drawing of cold flow unit

The cold-flow unit will be capable of simulating a fully integrated system for solids transfer and control, which is common to many advanced coal-fired power systems. Currently, DOE is providing financial support for operations or design and construction of six CFB process plants.

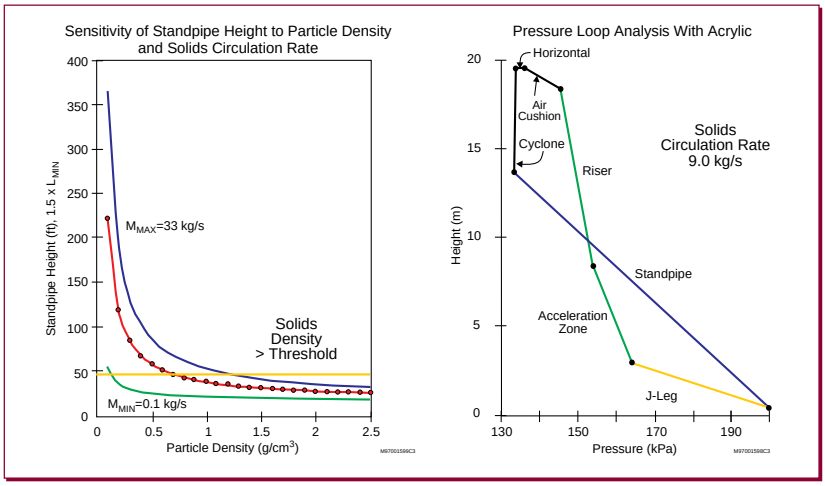
The cold-flow unit will consist of a riser, a two-stage cyclone, standpipe, and a 2-ft diameter fluidized bed (FB) with an associated cyclone and make-up hopper. Transport lines will connect these vessels in a variety of configurations with mechanical and non-mechanical solids control valves. The main riser is 1 ft diameter, 56 ft high, and consists of metal and acrylic spool pieces. The facility will have a supply of 250,000 scf/h air with the ability to obtain superficial velocities of 10 to 30 ft/s in the riser, and 0.2 to 0.7 ft/s in the FB. The operating pressures will range from 0 to 15 psig at the riser outlet and up to 30 psig in the FB. The FB vessel is pressurized so that a representative differential pressure can be attained between the FB and the riser.



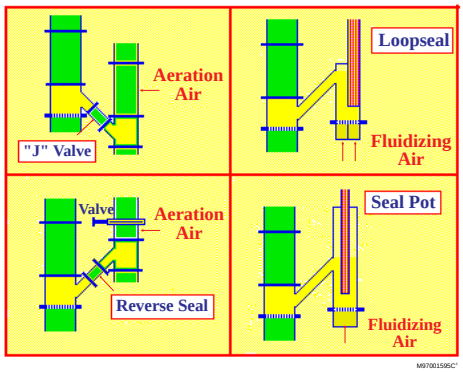
Simplified process flow diagram for the cold flow circulating fluid bed test facility

Conceptual design and process safety review of the cold-flow unit were completed earlier this year. Detailed design of the unit has been initiated and is progressing according to schedule. Construction of the cold-flow unit should be completed by the end of 1997.

Cold-Flow Circulating Fluid-Bed Unit



Pressure profiles and operating conditions achievable in the cold flow test facility

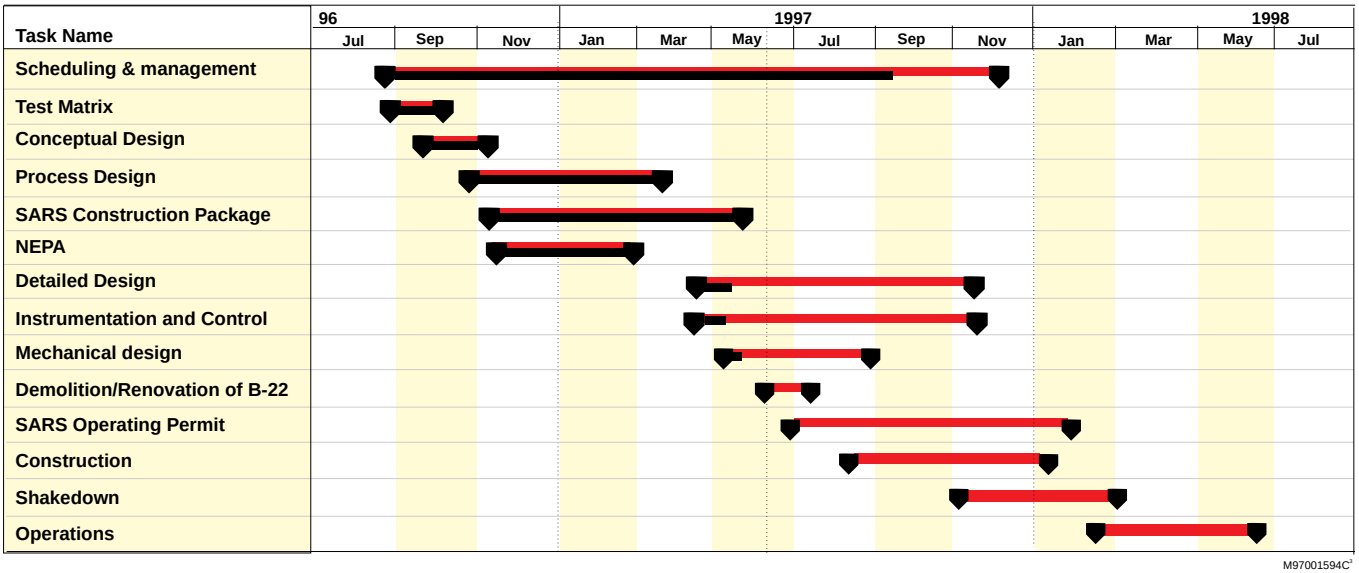


Non-mechanical valve configurations to be tested

Opportunities

The cold-flow circulating fluid-bed unit provides the following opportunities:

- A ***users test facility*** for private industry to test specific component designs and configurations.
- Better understanding of operational principles of gas-solid transfer and control among reactor vessels.
- Data to verify the mathematical models; use these data to develop stochastic and engineering models.
- Design and scale-up data of gas-solid transfer devices.
- A platform to develop and test instrumentation and novel non-mechanical valves, down-comers, and other devices.
- A training simulator for plant operating personnel.



Schedule for design, construction, and operation of the cold flow CFB test facility